

Key Points

- The Federal Communication Commission (FCC) plans to shift airwaves from TV broadcast to wireless use to respond to shifts in airwave demand.
- In 2016, the FCC held a two-phase auction. In the first phase, TV broadcasters determined the lowest acceptable selling price. In the second phase, wireless data companies determined the highest acceptable purchase price. Taxpayers kept the difference which can be used to cover the cost of license reassignment.
- However, simulations show that the FCC's auction rules don't maximize taxpayer value. When one company owns multiple TV broadcast licenses, it's possible for that company to increase the selling price by limiting the supply of licenses available on the auction. Therefore, companies with multiple licenses can shift wealth from taxpayers to themselves.

Ownership Concentration and Strategic Supply Reduction

[Ownership Concentration and Strategic Supply Reduction](#) shows the effect of companies that own multiple airwave licenses on the Federal Communications Commission's (FCC) 2016 auction of airwaves. [Ulrich Doraszelski](#), [Katja Seim](#), [Michael Sinkinson](#), and [Peichun Wang](#) examine how owners of multiple airwave licenses are able to raise the selling price of licenses by limiting the supply. License ownership concentration results in fewer airwaves being transferred from TV broadcast use to wireless data use and shifts wealth from taxpayers to companies that owned TV broadcast licenses.

Shifts in Broadcast Airwave Use

Today, fewer American households rely on broadcast TV than in the past. For example, in 2010, only 10 percent of households relied on broadcast TV. Meanwhile, demand for wireless data is rising. In 2016, [77 percent](#) of American adults owned smartphones compared to [35 percent](#) in 2011. If wireless data companies hold more airwave licenses, then Americans who use wireless data will be able to do so at higher speeds and lower costs. To respond to the shift in airwave use, the FCC held an auction to transfer airwave licenses from TV broadcasting to wireless data use.

The Distribution of Airwave Licenses in the U.S.

The FCC assigns broadcast licenses across designated market areas (DMAs). There are 210 DMA's in the US that vary in area and population size. Each license is the equivalent of 6 MHz of spectrum. The FCC set an initial goal of shifting 126 MHz of the total U.S. airwave spectrum from broadcast TV use to wireless use.

The Value of Airwave Licenses

The value of a license to a TV broadcasting company is primarily determined by the amount of advertising revenue that the specific airwaves earn. Therefore, licenses owned by stations with more viewers are worth more to their owners. For example, airwaves owned by CBS ([8.8 million](#) prime time viewers in 2016) are more valuable than those owned by The CW ([1.8 million](#) prime time viewers in 2016). DMA populations vary from over 7 million to only 4,230 TV households.

The value of a license to a wireless data company is determined by customer demands for data. Owning more spectrum increases the speed of wireless data usage, reduces consumer costs and therefore increases customer satisfaction.

The FCC's Two-Phase Auction Design

The FCC spent years designing a two-phase auction so that companies could not manipulate prices for their gain and the government's loss. The first phase of the auction included several rounds of a [reverse auction](#) with a descending clock. In each round of the reverse auction owners of TV broadcast licenses were offered a price and decided to accept the price or leave the auction. Rounds continued until the auction goal was met. The reverse auction set the lowest price TV broadcasters would accept to sell an airwave license.

The second phase of the auction included several rounds of a forward auction. In each round of the forward auction wireless companies were offered an airwave license for a price. The price was lowered until the license was sold. Rounds continued until the auction goal was met. The forward auction set the highest price wireless companies would accept to buy an airwave license.

The two-phase auction was repeated until the auction cleared and the FCC made a profit after covering the cost of repurposing the airwaves. Table 1 shows that the FCC auction did not clear until the auction was conducted four times.

Results of the FCC's Two-Stage Auction

As Table 1 shows, the FCC's two-phase auction did not clear in the first three stages. The first stage of the auction yielded an [86.42 billion](#) dollar sell price for 126 MHz from the reverse auction, but buyers were only willing to pay [23.11 billion](#) dollars. After each stage the FCC lowered the amount of MHz to be repurposed. By stage 4 the FCC lowered its goal to 84 MHz. Stage 4 of the auction cleared with the FCC gaining over \$9 billion to repurpose airwaves and for taxpayer use. The auction transferred 1/3 fewer licenses than the FCC's initial goal.

Table 1: FCC Auction Results

	Stage 1	Stage 2	Stage 3	Stage 4
Goal (MHz)	126	114	108	84
Actual (MHz)	0	0	0	84
TV Broadcaster Asking Price (billions of dollars)	86.42	54.59	40.31	10.05
Wireless Company Offered Price (billions of dollars)	23.11	21.52	19.68	19.63

Note: The price offered by wireless companies for stage 4 in the table is the price that was set in the forward auction. The price increased to \$19.77 billion after the assignment phase was complete.

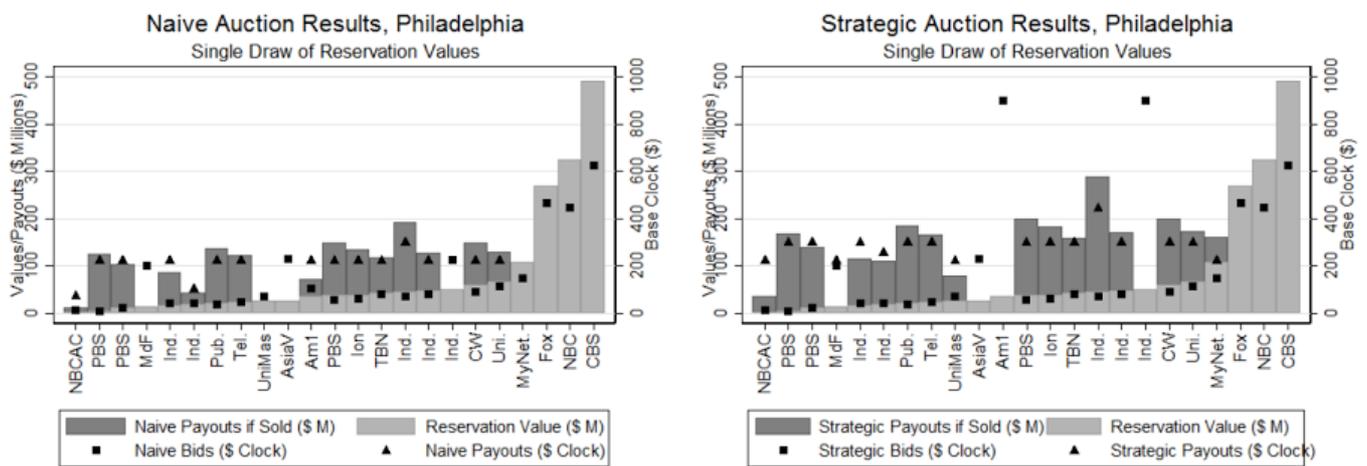
Source: [FCC Public Reporting System Auction Summaries](#)

The Impact of License Ownership Concentration

Doraszelski, Seim, Sinkinson, and Wang (2017) compare simulated auction results when each airwave license within a DMA is owned by a different company and when companies own multiple licenses. When each license is owned by a different company, the auction price is not accepted when the price is too low to justify selling each license. In contrast, when companies own multiple licenses, they can withdraw their least valuable licenses first. Withdrawing the least valuable licenses first restricts the supply of licenses available for sale in the DMA. Thereby, prices for the remaining licenses rise. In simulations, when companies own multiple licenses within a DMA it raises the price paid by the FCC by 22 percent for the FCC’s initial clearing target of 120 MHz.

For example, Figure 1 shows simulation outcomes in the Philadelphia DMA for when each license is owned by a different company (naïve auction results) and when companies own multiple licenses (strategic auction results). On average, the difference between the bid (triangle) and payout (square) is larger when companies own multiple licenses.

Figure 1: Sample Outcomes under Naïve and Strategic Bidding in Philadelphia DMA



Note: Graphs show the payouts under the two different strategies in a simulation. We can see the large difference between the payouts due to the strategic bidding of several firms in the auction. Companies only showing a bid price (the square) did not sell their licenses in the simulation. Source: Doraszelski, Seim, Sinkinson, and Wang (2017)

The FCC auction was designed for companies that owned a single license. Nevertheless, companies with multiple licenses were prevalent in the market. The majority of licenses eligible for auction were UHF licenses. In 2012, 125 DMA's had at least one owner who owned multiple UHF licenses. In fact, only 330 of the 1,672 UHF licenses eligible for the FCC’s auction were owned by a company that held only one license. The authors conclude that the auction design not accounting for companies that owned multiple airwave licenses within a DMA, reduced the value generated by the auction for the taxpayer, and that the role of multi-license ownership increases in the amount of spectrum the FCC cleared. Demand for licenses by wireless companies was weaker than expected in the forward auction, reducing the amount of spectrum the auction was able to reallocate.

Adjustments to Auction Design

Doraszelski, Seim, Sinkinson, and Wang (2017) show that the FCC can adjust auction design to achieve more value for taxpayers in future auctions. For instance, the FCC could change auction rules to anticipate participation by companies that own multiple licenses. The authors find that if license owners are required to withdraw their highest value broadcast licenses first, up to 80 percent of the price distortion caused by ownership of multiple licenses disappears. Plus, requiring owners to withdraw their highest value licenses first would increase the number of low value licenses in the reserve auction, thereby reducing the total selling price.

Conclusion

Doraszelski, Seim, Sinkinson, and Wang explore the effectiveness of the FCC's 2016 two-phase auction for airwave licenses. The auction succeeded in shifting 84 MHz from TV broadcasters to wireless companies and enabled the FCC to gain over \$9 billion to repurpose airwaves and for taxpayer use. However, simulations indicate that firms holding multiple licenses withdraw some low value licenses in order to decrease the total supply and raise selling prices, suggesting the auction had the potential to generate further revenue for the taxpayer. Adjustments to auction design and further research could help the FCC achieve their goal amount of MHz to be transferred and more value for taxpayers in future auctions.